PATENT ABSTRACTS OF JAPAN

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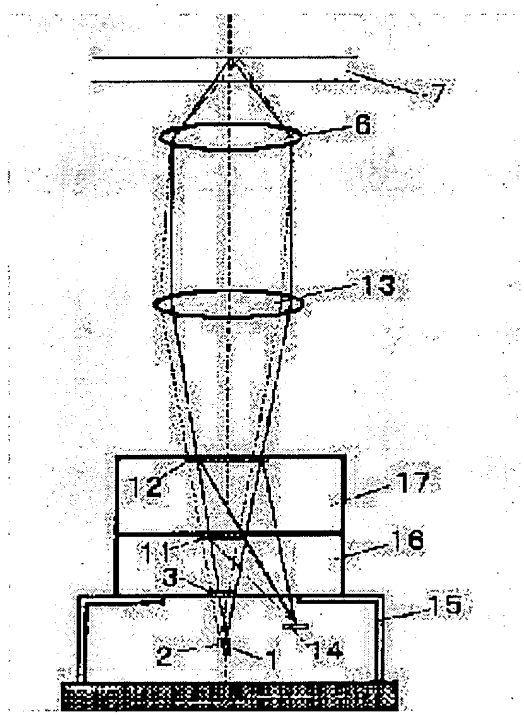
(54) OPTICAL PICKUP DEVICE



(57)Abstract:
PROBLEM TO BE SOLVED: To provide an optical pickup device which is compatible with plural recording and reproducing optical disks to different standards by using light beams of different wavelengths, easy to assemble and adjust, and moreover suitable for miniaturization and integration.
SOLUTION: 1st semiconductor laser 1 oscillating in a 650 nm band and 2nd semiconductor laser 2 oscillating in a 780 nm band are arranged proximately. A 3-beam purpose diffraction grating 3 for generating three beams for tracking control, a two-splitting 2nd hologram element 11 diffracting only the 2nd semiconductor laser light, and a four-splitting 1st hologram element 12 diffracting only the laser light of the 1st semiconductor laser are arranged in the optical axes of the 1st semiconductor laser 1 and the 2nd semiconductor laser 2. The light emitted from the 1st semiconductor laser 1 is focused on a disk 7, and the reflected light is diffracted by the hologram element 12 and guided to a photodetector 14. After the light emitted from the semiconductor 2 is separated into three beams through the diffraction grating 3, they are focused on the disk 7, and the reflected return light is diffracted by the hologram element 11 and guided to the photodetector 14.

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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] Optical pickup equipment characterized by providing the following The 1st light source which carries out outgoing radiation of the light beam of the 1st wavelength The 2nd light source which carries out outgoing radiation of the light beam of the 2nd different wavelength from the 1st wavelength, the 1st hologram component which does not carry out abbreviation diffraction of the light beam of the 2nd wavelength while diffracting the light beam of the 1st wavelength and leading to a photo detector, and the 2nd hologram component which does not carry out abbreviation diffraction of the light beam of the 1st wavelength while diffracting the light beam of the 2nd wavelength and leading to said photo detector

[Claim 2] Optical pickup equipment characterized by providing the following The 1st light source which generates the light beam of the 1st wavelength The 2nd light source which generates the light beam of the 2nd different wavelength from the 1st wavelength The diffraction grating for beam division which is allotted into the optical path to the optical disk of one [at least] outgoing radiation light of the 1st light source and the 2nd light source, and divides the light of one [at least] wavelength of the 1st wavelength and the 2nd wavelength into three beams While being allotted into the optical path to said optical disk of the outgoing radiation light from the 1st light source and the 2nd light source, diffracting the light of the 1st wavelength reflected from said optical disk and leading to a photo detector It is allotted into the optical path to the 1st hologram component which does not diffract the light of the 2nd wavelength, and said optical disk of the outgoing radiation light from the 1st light source and the 2nd light source. The 2nd hologram component which does not diffract the light of the 1st wavelength while being reflected from said optical disk, diffracting the light of the 2nd wavelength which penetrated the 1st hologram component and leading to said photo detector
[Claim 3] The 1st and 2nd hologram components are optical pickup equipment characterized by being formed so that the product of zero-order diffraction efficiency and the primary -primary diffraction efficiency may become [as opposed to / respectively / the light of the 1st and 2nd wavelength] max in optical pickup equipment according to claim 1 or 2.
[Claim 4] It is optical pickup equipment characterized by forming independently the 1st hologram component and the 2nd hologram component in the 1st substrate and the 2nd substrate possible [adjustment] in optical pickup equipment according to claim 1 to 3, respectively.
[Claim 5] In optical pickup equipment according to claim 1 to 3 the 1st and 2nd hologram components The hologram component which is formed in the 1st substrate and the 2nd substrate by which the laminating was carried out on the abbreviation same optical axis, respectively, and was formed in the field which contacts mutually [the 1st substrate and the 2nd substrate] is optical pickup equipment characterized by forming the formation part of a hologram lower than the substrate side of the circumference of it.
[Claim 6] In optical pickup equipment according to claim 1 to 3 the 1st and 2nd hologram components It is formed in the 1st substrate and the 2nd substrate by which the laminating was carried out on the abbreviation same optical axis, respectively. One side of the 1st hologram component and the 2nd

hologram component is formed in the field which contacts mutually [the 1st substrate and the 2nd substrate]. The optical pickup characterized by forming the crevice in the part which counters one [in the substrate with which the hologram component of another side was formed / said] hologram component.
[Claim 7] It is the optical pickup which the 1st and 2nd hologram components are formed in the 1st substrate and the 2nd substrate which have been arranged on an abbreviation same optical axis in optical pickup equipment according to claim 1 to 3, respectively, and is characterized by carrying out the laminating of the 1st substrate and 2nd substrate through a spacer.
[Claim 8] It is optical pickup equipment characterized by being formed in the 1st substrate and the 2nd substrate with which the 1st and 2nd hologram components have been arranged on an abbreviation same optical axis in optical pickup equipment according to claim 2, respectively, and forming said diffraction grating for beam division in the field of the opposite side of the forming face of the 2nd hologram component in the 2nd substrate.
[Claim 9] It is the optical pickup which the 1st light source is the red laser of 650nm band, and the 2nd light source is the infrared laser of 780nm band, and the channel depth of the 1st hologram component is 1.7-1.8 micrometers, and is characterized by setting the channel depth of the 2nd hologram component as 1.3-1.4 micrometers in optical pickup equipment according to claim 1 to 8.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the optical pickup which carries out record playback of the information optically to information record media, such as an optical disk and an optical card. The compatible optical pickup which can respond to the optical disk of specification with which the plurality which carries out record playback using the light beam of especially different wavelength differs is offered.
[0002]
[Description of the Prior Art] In recent years, since an optical disk can record a lot of information signals by high density, use is advanced in many fields, such as an audio, video, and a computer.
[0003] Especially, the disk of specification with which versatility, such as CD, and CD-R, DVD, differs in an optical disk is marketed, and the compatibility which can record or play the disk of such different specification by the single optical pickup is demanded. As for CD or CD-R, the property of a substrate or a record medium is optimized to the infrared light beam with a wavelength of 780nm, and DVD is optimized to the red light beam near the wavelength of 650nm. Moreover, development of the record or the playback disk using the blue glow beam around 400nm will also be furthered in the future.
[0004] As an optical pickup which is compatible to the disk recorded or played on such different wavelength, the optical pickup of a publication is proposed by JP,9-128794,A, for example.
[0005] Drawing 12 is drawing showing the configuration of the optical pickup of a publication in JP,9-128794,A. This optical pickup is equipped with the hologram component 8 which is made to diffract the reflected light from the grid lens 5 which does a concave lens operation so, an objective lens 6, and a disk 7, and is led to a photo detector according to the direction of polarization of the diffraction grating 3 for 3 beams and light beam which produce three beams for tracking control from the 2nd semiconductor laser 2 oscillated with the 1st 1,780nm band of semiconductor laser oscillated with 635nm band, and the light beam of each light source, and the photo detector 9. Moreover, the 1st semiconductor laser 1 and the 2nd semiconductor laser 2 are arranged so that the polarization direction may intersect perpendicularly mutually.
[0006] First, the 1st semiconductor laser 1 of 635nm band explains the actuation in the case of playing an optical disk with a substrate thickness of 0.6mm. After it is separated into three beams by the diffraction grating 3 and the light which carried out outgoing radiation from semiconductor laser 1 penetrates the hologram component 8, it is condensed by recording surface 7a of a disk 7 with an objective lens 6 with the grid lens 5, without receiving an operation. It reflects, and the light which has returned is diffracted with the hologram component 8, and is led to a photo detector 9. A grid pattern from which the direction of polarization of a light beam does not receive an operation with the grid lens 5 is formed.
[0007] Next, the 2nd semiconductor laser 2 of 780nm band explains the actuation in the case of playing an optical disk with a substrate thickness of 1.2mm. After it similarly separates into three beams by the diffraction grating 3 and the light which carried out outgoing radiation from semiconductor laser 2

penetrates the hologram component 8, it is condensed by recording surface 7b of a disk 7 with an objective lens 6 in response to a concave lens operation with the grid lens 5. It reflects, and similarly the light which has returned is diffracted with the hologram component 8, and is led to a photo detector 9. A grid pattern from which the direction of polarization of a light beam receives an operation with the grid lens 5 is formed.
[0008] In addition, the concave lens operation with the grid lens 5 is designed so that the spherical aberration generated when disk thickness becomes thick [to 1.2mm] from 0.6mm may be amended.
[0009] In such a configuration, for example to the 1st semiconductor laser 1, the diffracted light of the disk reflected light is designing the hologram component 8 so that it may be led to a photo detector 9. And the arrangement relation of semiconductor laser 2 is set up so that the difference in the location on the photo detector 9 which the disk reflected light produces by the difference in the angle of diffraction by the difference in wavelength may be canceled to the 2nd semiconductor laser 2 of another wavelength. Moreover, both the light from the 2nd semiconductor laser was also separated into three beams by the diffraction grating 3, and the light from the 1st semiconductor laser has also detected the tracking error signal by the 3 beam method by the same photo detector.
[0010] By such arrangement, to originally two photo detectors having been required for, one photo detector can be used in common and components mark and the number of erectors can be reduced.
[0011]
[Problem(s) to be Solved by the Invention] In the above-mentioned conventional optical pickup, in case record playback is carried out to two or more kinds of optical disks using the light from two or more semiconductor laser from which wavelength differs, it is necessary to arrange the physical relationship of the light source (semiconductor laser) in the position relation for which it asked beforehand so that both of the light of wavelength may be led to a common photo detector.
[0012] However, when integrating semiconductor laser and a photo detector in one package, positioning immobilization is carried out at the stem in a package, and, as for a photo detector side, neither a location nor rotation adjustment can usually do semiconductor laser and a photo detector in many cases at the time of adjustment of a hologram component. That is, only adjustment of a hologram component performs **, for example for offset adjustment of a focal error signal or a tracking error signal often which is generated by semiconductor laser, the anchoring error of a photo detector, or the form tolerance of a hologram component anchoring side. In such a case, when a hologram component is adjusted so that one semiconductor laser light source may be suited, and using it by another semiconductor laser light source, possibility of shifting from an optimum state is high. That is, optimum coordination of a servo error signal cannot be performed, or it is necessary to make very severe semiconductor laser, anchoring tolerance of a photo detector, processing tolerance of a package, etc., and cost becomes high only by justification of the hologram component at the time of an assembly.
[0013] Moreover, the hologram component includes the aberration amendment function in many cases, in order to acquire the condensing property of hope on a photo detector, and a hologram pattern design which performs optimal aberration amendment to two or more different wavelength is also difficult.
[0014] Furthermore, in the above-mentioned conventional optical pickup, to the light of the semiconductor laser of two or more wavelength, all can detect only the tracking error signal by the 3 beam method, and cannot be applied to the optical disk of the specification from which the plurality using a different tracking error signal differs.
[0015] This invention can respond to the optical disk of specification with which the plurality which carries out record playback using the light beam of different wavelength differs, and assembly adjustment is easy and it aims at offering the compatible optical pickup which was moreover suitable for small integration.
[0016]
[Means for Solving the Problem] While optical pickup equipment according to claim 1 diffracts the 1st light source which carries out outgoing radiation of the light beam of the 1st wavelength, the 2nd light source which carries out outgoing radiation of the light beam of the 2nd different wavelength from the 1st wavelength, and the light beam of the 1st wavelength and leads them to a photo detector It has the

1st hologram component which does not carry out abbreviation diffraction of the light beam of the 2nd wavelength, and the 2nd hologram component which does not carry out abbreviation diffraction of the light beam of the 1st wavelength while diffracting the light beam of the 2nd wavelength and leading to said photo detector.

[0017] The 1st light source in which optical pickup equipment according to claim 2 generates the light beam of the 1st wavelength, The 2nd light source which generates the light beam of the 2nd different wavelength from the 1st wavelength, The diffraction grating for beam division which is allotted into the optical path to the optical disk of the outgoing radiation light from at least one side of the 1st light source and the 2nd light source, and divides the light of one [at least] wavelength of the 1st wavelength and the 2nd wavelength into three beams, While being allotted into the optical path to said optical disk of the outgoing radiation light from the 1st light source and the 2nd light source, diffracting the light of the 1st wavelength reflected from said optical disk and leading to a photo detector It is allotted into the optical path to the 1st hologram component which does not diffract the light of the 2nd wavelength, and said optical disk of the outgoing radiation light from the 1st light source and the 2nd light source. It is reflected from said optical disk, and while diffracting the light of the 2nd wavelength which penetrated the 1st hologram component and leading to said photo detector, it has the 2nd hologram component which does not diffract the light of the 1st wavelength.

[0018] The 1st and 2nd hologram components are formed so that, as for optical pickup equipment according to claim 3, the product of zero-order diffraction efficiency and the primary -primary diffraction efficiency may become max to the light of the 1st and 2nd wavelength in optical pickup equipment according to claim 1 or 2, respectively.

[0019] In optical pickup equipment according to claim 1 to 3, the 1st hologram component and the 2nd hologram component are formed in the 1st substrate and the 2nd substrate independently for optical pickup equipment according to claim 4 possible [adjustment], respectively.

[0020] Optical pickup equipment according to claim 5 is set to optical pickup equipment according to claim 1 to 3. The 1st and 2nd hologram components The formation part of a hologram is lower than the substrate side of the circumference of it, and the hologram component which is formed in the 1st substrate and the 2nd substrate by which the laminating was carried out on the abbreviation same optical axis, respectively, and was formed in the field which contacts mutually [the 1st substrate and the 2nd substrate] is formed.

[0021] Optical pickup equipment according to claim 6 is set to optical pickup equipment according to claim 1 to 3. The 1st and 2nd hologram components It is formed in the 1st substrate and the 2nd substrate by which the laminating was carried out on the abbreviation same optical axis, respectively. The crevice is formed in the part which counters one [in the substrate with which one side of the 1st hologram component and the 2nd hologram component is formed in the field which contacts mutually / the 1st substrate and the 2nd substrate /, and the hologram component of another side was formed / said] hologram component.

[0022] Optical pickup equipment according to claim 7 is formed in the 1st substrate and the 2nd substrate with which the 1st and 2nd hologram components have been arranged on an abbreviation same optical axis in optical pickup equipment according to claim 1 to 3, respectively, and the laminating of the 1st substrate and 2nd substrate is carried out through the spacer.

[0023] In optical pickup equipment according to claim 2, it is formed in the 1st substrate and the 2nd substrate with which the 1st and 2nd hologram components have been arranged on an abbreviation same optical axis, respectively, and, as for optical pickup equipment according to claim 8, said diffraction grating for beam division is formed in the field of the opposite side of the forming face of the 2nd hologram component in the 2nd substrate.

[0024] In optical pickup equipment according to claim 1 to 8, the 1st light source of optical pickup equipment according to claim 9 is the red laser of 650nm band, the 2nd light source is the infrared laser of 780nm band, the channel depth of the 1st hologram component is 1.7-1.8 micrometers, and the channel depth of the 2nd hologram component is set as 1.3-1.4 micrometers.

[0025]

[Embodiment of the Invention] The gestalt of operation of this invention is shown in a detail using drawing. In addition, the same sign shows the same thing as the component shown in the conventional example.
[0026] In addition, with the gestalt of the following operations, it has the two light sources (semiconductor laser) which carry out outgoing radiation of the light beam of 650nm band and 780nm band, and the optical pickup equipment which divides only the light of 780nm band into three beams, and irradiates an optical disk is explained. However, this invention is not restricted to this and the number of exposure wavelength and a light beam etc. can be changed suitably.
[0027] <Gestalt 1 of operation> drawing 1 is the mimetic diagram showing the configuration of the optical pickup equipment of the gestalt 1 of operation of this invention. This pickup is the same configuration as drawing 12 fundamentally, and gives the same sign to the same component as drawing 12 .
[0028] It has the 2nd hologram component 11, collimator lens 13, objective lens 6, and photo detector 14 to which the 1st semiconductor laser 1 which oscillates this optical pickup with 650nm band, and the 2nd semiconductor laser 2 oscillated with 780nm band diffract only the diffraction grating 3 for 3 beams which contiguity arrangement is carried out [diffraction grating] and produces three beams for tracking control, the 1st hologram component 12 which diffracts only the light of the 1st semiconductor laser, and the light of the 2nd semiconductor laser.
[0029] The diffraction grating 3 for 3 beams, the 1st hologram component 12, and the 2nd hologram component 11 are arranged as follows. That is, a diffraction grating 3 is formed in the transparence substrate 16 bottom, and the hologram component 11 is formed in the bottom. Moreover, the hologram component 12 is formed in another transparence substrate 17 bottom. And adjustment immobilization of the transparence substrate 16 is carried out in the laser outgoing radiation side of the laser package 15, and adjustment immobilization of the transparence substrate 17 is carried out on it. In addition, although considered as the configuration which forms one hologram component and diffraction grating in both sides of one substrate, and forms the hologram component of another side in one side of another substrate, if it does in this way, components mark are reducible here.
[0030] Drawing 2 (a) is the 1st semiconductor laser 1 of 650nm band, and is drawing showing the actuation in the case of playing an optical disk. After the light which carried out outgoing radiation from semiconductor laser 1 penetrates a diffraction grating 3 and the hologram components 11 and 12 and being made parallel light by the collimator lens 13, it is condensed on an optical disk 7 with an objective lens 6, and the light which has reflected and returned is diffracted with the hologram component 12, and is drawn on a photo detector 14.
[0031] Drawing 2 (b) is the 2nd semiconductor laser 2 of 780nm band, and is drawing showing the actuation in the case of playing an optical disk. After the light which carried out outgoing radiation is separated into three beams from semiconductor laser 2 by the diffraction grating 3, penetrating the hologram components 11 and 12 and being made parallel light by the collimator lens 13, it is condensed on a disk 7 with an objective lens 6, and the light which has reflected and returned is diffracted with the hologram component 11, and is led to a photo detector 14.
[0032] In addition, the hologram components 11 and 12 are designed so that the condensing property of hope of return light on a photo detector 14 may be acquired to the light beam from semiconductor laser 2 and 1, respectively.
[0033] Next, the hologram components 11 and 12 of the gestalt of this operation are explained.
** The diffraction efficiency of the hologram component of the shape of a wavelength selection nature rectangle of a hologram component is shown in drawing 3 and drawing 4 . The diffraction efficiency of a rectangle-like hologram with equal groove width of face and land width is zero-order diffraction-efficiency (permeability) eta0=(cos**phi) 2 primary [**] diffraction efficiency, when it is channel depth t, wavelength lambda, and the refractive index n of a transparence substrate. eta1=(2-/pixsin**phi) 2 (however, ** phi=pi t (n-1)/lambda)
It is come out and expressed.
[0034] Drawing 3 shows the relation between the wavelength of 650nm, zero-order [780nm] and

primary [**] diffraction efficiency, and a channel depth. Moreover, drawing 4 shows the product (both-way use effectiveness) of zero-order diffraction efficiency and primary [**] diffraction efficiency, and the relation of a channel depth. In addition, hologram glass is set to a quartz n= 1.457 (lambda= 650nm) and n= 1.454 (lambda= 780nm) here.

[0035] In the gestalt of this operation, one of hologram components need to diffract as many light as possible, and it is necessary to lead to a photo detector, and to the light beam of each wavelength, another hologram component almost needs to diffract light, and needs to twist (that is, the stray light is lessened as much as possible), and it is necessary to set up a channel depth like so that the use effectiveness of light can be earned.

[0036] Therefore, for example, the channel depth of the hologram component 12 which diffracts only the light of the 1st semiconductor laser 1 with a wavelength of 650nm It is referred to as about 1.7 micrometers to which the diffraction efficiency of 650nm is set to about 0 in drawing 4 , and diffraction efficiency becomes large by 780nm. What is necessary is just to set the channel depth of the hologram component 11 which diffracts only the light of the 2nd semiconductor laser 2 with a wavelength of 780nm to about 1.4 micrometers to which the diffraction efficiency of 780nm is set to about 0 in drawing 4 , and diffraction efficiency becomes large by 650nm.

[0037] The diffraction efficiency in the wavelength of another side [in / in the both-way use effectiveness of the light beam of the 2nd semiconductor laser 2 with a wavelength / according / the both-way use effectiveness of the light beam of the 1st semiconductor laser 1 with a wavelength / by the hologram component 12 / of 650nm / to about 9% and the hologram component 11 / of 780nm / about 8% and each hologram components 11 and 12] is about 0, and it stops producing loss of the quantity of light, and generating of the stray light at this time. If the channel depth of 1.7-1.8 micrometers and the hologram component 11 is set as 1.3-1.4 micrometers for the channel depth of the hologram component 12 even if it takes processing tolerance etc. into consideration, the property of practical use level will be acquired.

[0038] Moreover, the diffraction grating 3 for three beams is making it the channel depth of 1.4 micrometers, to light with a wavelength of 780nm, it is subbeam (primary [**] diffraction efficiency) 12%, and suitable 3 beam quantity of light ratio is obtained main beam (zero-order transmission) 72%. Moreover, to 650nm light, diffraction efficiency is hardly influenced by about 0 at this time.

[0039] ** The division pattern of the hologram components 11 and 12 and servo signal detecting method drawing 5 show the division pattern of the hologram component 12 which diffracts only the light of the 1st semiconductor laser 1, and the division pattern of a photo detector 14.

[0040] The hologram component 12 is equipped with four division fields, 12a, 12b, 12c, and 12d, quadrisected in the shape of a cross joint by making the substantial core of a return light beam into a zero. Moreover, the photo detector 14 is equipped with six two 2 division light-receiving fields (14a, 14b) and fields [of (14c, 14d), and others / 14e and 14f] fields.

[0041] The return light diffracted by division field 12a of the hologram component 12 in a focus condition like drawing 5 (a) A beam P1 is formed on 14l. of parting lines prolonged in the x directions of 2 division light-receiving field (14a, 14b). A beam P2 is formed on 14m of parting lines to which the return light diffracted at 12d of division fields extends in the x directions of 2 division light-receiving field (14c, 14d), and the division fields 12c and 12b form beams P3 and P4 on 14f of light-receiving fields, and 14e, respectively.

[0042] If an optical disk 7 approaches relatively [side / objective lens 6] from a focus condition, beams P1 and P2 will become large like drawing 5 (b) at the light-receiving field 14a or 14c side, respectively. On the other hand, if it keeps away relatively conversely, it will become large like drawing 5 (c) at the light-receiving field 14b or 14d side, respectively. The focal error signal FES uses this property, and is FES=(Sa+Sc)-(Sb+Sd) by the knife-edge method.
It is detectable with ******.

[0043] Moreover, the tracking error signal TES is detectable with a phase contrast method by the disk only for playbacks in which the concavo-convex pit was formed by carrying out the comparison operation of the phase of Sa, the sum signal of Sb and Sf, and the sum signal of Sc, and Sd and Se. In

addition, TES by the push pull method is also detectable with the operation of (Sa+Sb+Se)-(Sc+Sd+Sf). Furthermore, it is also possible to generate TES in a phase contrast method or the push pull method only using the light of one side 12b and 12c of a beam, i.e., division fields, or division fields [12a and 12d] one side.
[0044] In addition, an information regenerative signal is acquired from the sum of all output signals.
[0045] Next, the signal detection method is explained to be the division pattern of the hologram component 11 which diffracts only the light of the 2nd semiconductor laser using drawing 6 . In addition, the photo detector 14 is the same.
[0046] The hologram component 11 is equipped with two division fields of 11a and 11b which were carried out by 2 ****s of the parting lines of the direction of X. Moreover, since there is a diffraction grating 3 for three beams as drawing 1 explained to the hologram component 11 bottom, the outward trip beam which faces to a disk is separated into three from laser along about Y directions, and return light also has an include angle in the direction of Y, and comes to it on the contrary.
[0047] Like drawing 6 (a), about the return light of a main beam The light diffracted by division field 11a of the hologram component 11 in the focus condition A beam P1 is formed on 14l. of parting lines prolonged in the x directions of 2 division light-receiving field (14a, 14b), and the light diffracted by division field 11b forms a beam P2 on 14m of parting lines prolonged in the x directions of 2 division light-receiving field (14c, 14d). moreover, about the return light of the primary [+] subbeam The light diffracted in the division fields 11a and 11b of the hologram component 11 both forms beams P3 and P4 on light-receiving field 14e. About the return light of the primary [-] subbeam The light diffracted in the division fields 11a and 11b of the hologram component 11 constitutes so that beams P5 and P6 may be formed on [both] 14f of light-receiving fields.
[0048] If an optical disk 7 approaches relatively [side / objective lens 6] from a focus condition, beams P1 and P2 will become large like drawing 6 (b) at the light-receiving field 14b or 14c side, respectively. On the contrary, if it keeps away relatively, it will become large like drawing 5 (c) at the light-receiving field 14a or 14d side, respectively.
[0049] therefore, the case where the focal error signal FES uses the single knife-edge method using the above-mentioned property -- FES=Sa-Sb or -- It is detectable with the operation of FES=Sc-Sd.
[0050] Moreover, it is FES=(Sb+Sc)-(Sa+Sd) when the double knife-edge method is used.
It is detectable with ******.
[0051] In addition, the tracking error signal TES can detect TES by the 3 beam method by the operation of Se-Sf.
[0052] ** Explain important offset adjustment of FES in adjustment of the adjustment hologram component 12 of the hologram components 11 and 12. Drawing 7 (a) and (b) show only the hologram component 12 and photo detectors [for FES detection / 14a, 14b, 14c, and 14d] part. The light diffracted by division field 12a of the hologram component 12 in the focus condition like above-mentioned drawing 5 (a) at the time of a design A beam P1 is formed so that it may condense on 14l. of parting lines prolonged in the x directions of 2 division light-receiving field (14a, 14b), and the beam P2 is formed so that it may condense on 14m of parting lines to which the light diffracted at 12d of division fields extends in the x directions of 2 division light-receiving field (14c, 14d).
[0053] However, in actual hologram / laser unification package, the relative position of a hologram, a laser chip, and a photo detector has shifted in a certain tolerance zone from the design value according to the laser chip, the anchoring error of a photo detector, a package, the processing error of a stem, etc. Therefore, the condensing beams P1 and P2 shift from on a parting line like drawing 7 (a), or it shifts from a condensing condition and the beam is large. Therefore, FES calculated by FES=(Sa+Sc)-(Sb+Sd) will generate offset also in the focus condition of an objective lens.
[0054] Then, by rotating the hologram component 12 and moving beams P1 and P2 on a parting line into a flat surface perpendicular to an optical axis, like drawing 7 (b), it adjusts so that offset of FES may be set to 0.
[0055] Moreover, adjustment with the same said of the hologram component 11 is performed. Drawing 8 (a) and (b) show only the hologram component 11 and photo detectors [for FES detection / 14a, 14b,

14c, and 14d] part. Although this is an example at the time of using the single knife-edge method the output difference of 14a and 14b detects FES, offset is made to be set to 0 by rotation adjustment like a hologram 12.

[0056] In the gestalt of this operation, contiguity arrangement of the two laser chips, 650nm and 780nm, is carried out. It shifts in a tolerance zone with the location of each chip, when it fixes to the stem which does not illustrate this, it is attached or there is dispersion in an emitting [laser] light point location, an outgoing radiation include angle, etc., but since offset adjustment of FES is performed with a respectively different hologram component (11 12), optimal adjustment can be independently performed to each semiconductor laser (1 2).

[0057] ** In the configuration above-mentioned optical system of a hologram component, as shown in drawing 9 (a), it is the block diagram which carries in piles two transparence substrates in which the hologram components 11 and 12 and a diffraction grating 3 were formed, and performs a location and rotation adjustment. a glass substrate -- etching -- etc. -- a hologram -- forming -- a case -- a hologram -- a component -- 11 -- a land -- a part -- a top face -- a hologram -- forming -- having -- **** -- a part -- 11 -- ' -- a diffraction grating -- three -- a land -- a part -- a top face -- forming -- having -- **** -- a part -- three -- ' -- the same -- a field -- becoming -- **** . The part in which, as for the top face of the laser package 15, i.e., the outgoing radiation side of a laser beam, in which the transparence substrate 16 is attached, a diffraction grating 3 is located usually like drawing 9 (a) does not have a problem, in order to contact, but it may get damaged when the fine structure piles up the transparence substrate 17 about the hologram component 11 formed in the top face of the transparence substrate 16, for example. The example which performed the cure to this is shown below.

[0058] After it carves and investigates a hologram formation part by etching etc. first, drawing 9 (b) forms a hologram, or he removes a land from the same field further, and is trying to investigate it in the case of a glass substrate, when forming the hologram component 11 in the transparence substrate 16. Moreover, what is necessary is also in the case of molding processing using plastics or a glass ingredient, just to form a mold configuration so that a circumference part may become high from a hologram component part.

[0059] Moreover, drawing 9 (c) is the example which investigated the transparence substrate 17 bottom. Since this does not need to change the complicated production approach of the hologram component 11, it can perform high processing of precision easily.

[0060] Drawing 9 (d) fixes both on both sides of a spacer between two transparence substrates 16 and 17. Even when the transparence substrate which formed the hologram component of two sheets by this is fixed in piles, the hologram formed in the part pinched by both does not get damaged at the time of adjustment.

[0061] As explained above, with the optical pickup equipment of the gestalt of this operation As opposed to the 1st semiconductor laser 1 oscillated with 650nm band by which contiguity arrangement was carried out, and the 2nd semiconductor laser 2 oscillated with 780nm band Although arranged in order of the diffraction grating 3 for 3 beams which produces three beams for tracking control, the hologram component 11 which diffracts only the light of the 2nd semiconductor laser, and hologram component which diffracts only light of 1st semiconductor laser 12** It is not necessary to constitute especially from this sequence, and the hologram components 11 and 12 should just be formed in another substrate. The diffraction grating 3 for 3 beams and the hologram component 11 which produce three beams for tracking control which merely diffract only the light of the 2nd semiconductor laser 2 are [no need for adjustment of the direction currently positioned and formed in both sides of one transparence substrate] and are advantageous.

[0062] Moreover, when detecting a signal with one beam, without using the 3 beam method for TES, the diffraction grating for 3 beams is unnecessary.

[0063] <Gestalt 2 of operation> drawing 10 is the mimetic diagram showing the configuration of the gestalt 2 of operation. Although the configuration of an optical pickup is the same as that of the gestalt 1 (drawing 1) of operation fundamentally, the approaches a semiconductor laser chip should cling differ. This part is explained using drawing 10 . The same sign is shown in the same component.

[0064] In the gestalt 1 of operation, contiguity arrangement was carried out and the laser chip of two different wavelength was attached. However, for a certain reason, the width of face of a direction perpendicular to an optical axis will also leave about 100-300 micrometers also of distance between each point emitting light more than it, and an inclination will produce a laser chip in an optical axis in the laser beam of two different wavelength in the optical system shown in drawing 1 . The aberration generated with an optical-axis inclination is designed so that it may become small with a collimator lens or an objective lens to some extent, but if the distance between the points emitting light becomes large, it will become a problem as a property of pickup.
[0065] Then, in the gestalt of this operation, in order to make in agreement the optical axis of the light beam from a different laser chip, prism is used. As shown in drawing 10 , only distance d1 is detached to a stem 26, the 1st semiconductor laser 1 and 2nd semiconductor laser 2 are attached in it, and the beam splitter 21 which is from three members, 21a, 21b, and 21c, on the outgoing radiation side side is formed. This has two reflectors, 19 and 20, reflects the light of the 2nd semiconductor laser in respect of [19] separation, and is having structure of making the light of the 1st semiconductor laser penetrating. Although the property of this separation side is giving wavelength selection nature, when both polarization directions differ, a polarization beam splitter is sufficient as it. 45 degrees of each reflector incline to an optical axis, and it can make two light beams which came out of the 1st and 2nd semiconductor laser in agreement with the same optical axis by setting up the board thickness of member 21b so that it may have the direction distance of an optical axis between the reflectors equivalent to d1.
[0066] Moreover, about the 1st semiconductor laser 1 and 2nd semiconductor laser 2, since it will become the same optical axis after compounding by the beam splitter 21, even if it arranges in which location if it is on the 1st optical axis 22 and the 2nd optical axis 23 on a stem, respectively, it is also possible to shift one laser from the focal location of a collimator lens, and to use it as emission light or a convergence light.
[0067] It can respond to the optical disk of specification with which the plurality which carries out record playback by this using the light beam of different wavelength differs, and assembly adjustment is easy and the compatible optical pickup which was moreover suitable for small integration can be realized.
[0068] <Gestalt 3 of operation> drawing 11 is the mimetic diagram showing the principal part of the optical pickup equipment of the gestalt 3 of operation. Although the configuration of an optical pickup is the same as that of the gestalt 1 (drawing 1) of operation fundamentally, the configurations of the synthetic prism of the approach a semiconductor laser chip should cling, and two semi-conductor laser beams differ. In addition, in drawing 11 , the same sign is given to the same component as drawing 1 .
[0069] In the gestalten 1 and 2 of operation, since two hologram components 11 and 12 were mostly arranged on the same optical axis, for the improvement in efficiency for light utilization, or stray light removal, they needed to set the diffraction grating 3 for 3 beams, and the hologram component 11 as a channel depth which diffracts only the light of the 2nd semiconductor laser 2, and needed to set the hologram component 12 as a channel depth which diffracts only the light of the 1st semiconductor laser 1. In this case, there is a trouble that a channel depth becomes deeper than usual, or processing tolerance also becomes severe.
[0070] About the optical pickup equipment which can detect the light beam from two different laser by the common photo detector even if it does not use the hologram of what solves the above-mentioned trouble, i.e., wavelength selection nature, and can make an optical axis in agreement, as shown in drawing 11 , the gestalt of this operation detaches and attaches the 1st semiconductor laser 1 and 2nd semiconductor laser 2 in a stem 26, and considers them as the configuration which arranges a photo detector 14 in the meantime.
[0071] In the gestalt of this operation, the transparence substrates 16 and 17 are separately arranged after each laser chip, and for this reason, each hologram components 11 and 12 can be constituted so that only one light beam may pass. And the zero-order transmitted light which penetrated each hologram component is compounded on the same optical axis by the beam splitter 24 which has the prism 25 and

separation side 24a which have reflective mirror side 25a. The light beam which reflected and has returned from the disk is led to the common photo detector 14 with the hologram components 11 and 12 by which a location and rotation adjustment were carried out independently according to the individual, respectively.

[0072] It can respond to the optical disk of specification with which the plurality which carries out record playback using the light beam of different wavelength, without production using the hologram component of difficult wavelength selection nature by this configuration differs, and assembly adjustment is easy and becomes possible [realizing the compatible optical pickup which was moreover suitable for small integration].

[0073]

[Effect of the Invention] Since it is possible to adjust a hologram component independently to the light beam of each wavelength in the optical pickup equipment in which the compatible record or playback of an optical disk from which the wavelength of an exposure light beam differs is possible according to this invention, the optimal assembly adjustment is easily realizable to the light of each light source. Thereby, since a leeway is given in laser, the anchoring tolerance of a photo detector, the processing tolerance of a package, etc., cost can be lowered. Moreover, a different tracking error signal of the 3 beam method, a phase contrast method, or the push pull method is detectable in the completely same photo detector configuration.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention] This invention relates to the optical pickup which carries out record playback of the information optically to information record media, such as an optical disk and an optical card. The compatible optical pickup which can respond to the optical disk of specification with which the plurality which carries out record playback using the light beam of especially different wavelength differs is offered.

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] In recent years, since an optical disk can record a lot of information signals by high density, use is advanced in many fields, such as an audio, video, and a computer.
[0003] Especially, the disk of specification with which versatility, such as CD, and CD-R, DVD, differs in an optical disk is marketed, and the compatibility which can record or play the disk of such different specification by the single optical pickup is demanded. As for CD or CD-R, the property of a substrate or a record medium is optimized to the infrared light beam with a wavelength of 780nm, and DVD is optimized to the red light beam near the wavelength of 650nm. Moreover, development of the record or the playback disk using the blue glow beam around 400nm will also be furthered in the future.
[0004] As an optical pickup which is compatible to the disk recorded or played on such different wavelength, the optical pickup of a publication is proposed by JP,9-128794,A, for example.
[0005] Drawing 12 is drawing showing the configuration of the optical pickup of a publication in JP,9-128794,A. This optical pickup is equipped with the hologram component 8 which is made to diffract the reflected light from the grid lens 5 which does a concave lens operation so, an objective lens 6, and a disk 7, and is led to a photo detector according to the direction of polarization of the diffraction grating 3 for 3 beams and light beam which produce three beams for tracking control from the 2nd semiconductor laser 2 oscillated with the 1st 1,780nm band of semiconductor laser oscillated with 635nm band, and the light beam of each light source, and the photo detector 9. Moreover, the 1st semiconductor laser 1 and the 2nd semiconductor laser 2 are arranged so that the polarization direction may intersect perpendicularly mutually.
[0006] First, the 1st semiconductor laser 1 of 635nm band explains the actuation in the case of playing an optical disk with a substrate thickness of 0.6mm. After it is separated into three beams by the diffraction grating 3 and the light which carried out outgoing radiation from semiconductor laser 1 penetrates the hologram component 8, it is condensed by recording surface 7a of a disk 7 with an objective lens 6 with the grid lens 5, without receiving an operation. It reflects, and the light which has returned is diffracted with the hologram component 8, and is led to a photo detector 9. A grid pattern from which the direction of polarization of a light beam does not receive an operation with the grid lens 5 is formed.
[0007] Next, the 2nd semiconductor laser 2 of 780nm band explains the actuation in the case of playing an optical disk with a substrate thickness of 1.2mm. After it similarly separates into three beams by the diffraction grating 3 and the light which carried out outgoing radiation from semiconductor laser 2 penetrates the hologram component 8, it is condensed by recording surface 7b of a disk 7 with an objective lens 6 in response to a concave lens operation with the grid lens 5. It reflects, and similarly the light which has returned is diffracted with the hologram component 8, and is led to a photo detector 9. A grid pattern from which the direction of polarization of a light beam receives an operation with the grid lens 5 is formed.
[0008] In addition, the concave lens operation with the grid lens 5 is designed so that the spherical aberration generated when disk thickness becomes thick [to 1.2mm] from 0.6mm may be amended.
[0009] In such a configuration, for example to the 1st semiconductor laser 1, the diffracted light of the

disk reflected light is designing the hologram component 8 so that it may be led to a photo detector 9. And the arrangement relation of semiconductor laser 2 is set up so that the difference in the location on the photo detector 9 which the disk reflected light produces by the difference in the angle of diffraction by the difference in wavelength may be canceled to the 2nd semiconductor laser 2 of another wavelength. Moreover, both the light from the 2nd semiconductor laser was also separated into three beams by the diffraction grating 3, and the light from the 1st semiconductor laser has also detected the tracking error signal by the 3 beam method by the same photo detector.
[0010] By such arrangement, to originally two photo detectors having been required for, one photo detector can be used in common and components mark and the number of erectors can be reduced.

[Translation done.]

* NOTICES *

EFFECT OF THE INVENTION

[Effect of the Invention] Since it is possible to adjust a hologram component independently to the light beam of each wavelength in the optical pickup equipment in which the compatible record or playback of an optical disk from which the wavelength of an exposure light beam differs is possible according to this invention, the optimal assembly adjustment is easily realizable to the light of each light source. Thereby, since a leeway is given in laser, the anchoring tolerance of a photo detector, the processing tolerance of a package, etc., cost can be lowered. Moreover, a different tracking error signal of the 3 beam method, a phase contrast method, or the push pull method is detectable in the completely same photo detector configuration.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] In the above-mentioned conventional optical pickup, in case record playback is carried out to two or more kinds of optical disks using the light from two or more semiconductor laser from which wavelength differs, it is necessary to arrange the physical relationship of the light source (semiconductor laser) in the position relation for which it asked beforehand so that both of the light of wavelength may be led to a common photo detector.
[0012] However, when integrating semiconductor laser and a photo detector in one package, positioning immobilization is carried out at the stem in a package, and, as for a photo detector side, neither a location nor rotation adjustment can usually do semiconductor laser and a photo detector in many cases at the time of adjustment of a hologram component. That is, only adjustment of a hologram component performs **, for example for offset adjustment of a focal error signal or a tracking error signal often which is generated by semiconductor laser, the anchoring error of a photo detector, or the form tolerance of a hologram component anchoring side. In such a case, when a hologram component is adjusted so that one semiconductor laser light source may be suited, and using it by another semiconductor laser light source, possibility of shifting from an optimum state is high. That is, optimum coordination of a servo error signal cannot be performed, or it is necessary to make very severe semiconductor laser, anchoring tolerance of a photo detector, processing tolerance of a package, etc., and cost becomes high only by justification of the hologram component at the time of an assembly.
[0013] Moreover, the hologram component includes the aberration amendment function in many cases, in order to acquire the condensing property of hope on a photo detector, and a hologram pattern design which performs optimal aberration amendment to two or more different wavelength is also difficult.
[0014] Furthermore, in the above-mentioned conventional optical pickup, to the light of the semiconductor laser of two or more wavelength, all can detect only the tracking error signal by the 3 beam method, and cannot be applied to the optical disk of the specification from which the plurality using a different tracking error signal differs.
[0015] This invention can respond to the optical disk of specification with which the plurality which carries out record playback using the light beam of different wavelength differs, and assembly adjustment is easy and it aims at offering the compatible optical pickup which was moreover suitable for small integration.

[Translation done.]

MEANS

[Means for Solving the Problem] While optical pickup equipment according to claim 1 diffracts the 1st light source which carries out outgoing radiation of the light beam of the 1st wavelength, the 2nd light source which carries out outgoing radiation of the light beam of the 2nd different wavelength from the 1st wavelength, and the light beam of the 1st wavelength and leads them to a photo detector It has the 1st hologram component which does not carry out abbreviation diffraction of the light beam of the 2nd wavelength, and the 2nd hologram component which does not carry out abbreviation diffraction of the light beam of the 1st wavelength while diffracting the light beam of the 2nd wavelength and leading to said photo detector.
[0017] The 1st light source in which optical pickup equipment according to claim 2 generates the light beam of the 1st wavelength, The 2nd light source which generates the light beam of the 2nd different wavelength from the 1st wavelength, The diffraction grating for beam division which is allotted into the optical path to the optical disk of the outgoing radiation light from at least one side of the 1st light source and the 2nd light source, and divides the light of one [at least] wavelength of the 1st wavelength and the 2nd wavelength into three beams, While being allotted into the optical path to said optical disk of the outgoing radiation light from the 1st light source and the 2nd light source, diffracting the light of the 1st wavelength reflected from said optical disk and leading to a photo detector It is allotted into the optical path to the 1st hologram component which does not diffract the light of the 2nd wavelength, and said optical disk of the outgoing radiation light from the 1st light source and the 2nd light source. It is reflected from said optical disk, and while diffracting the light of the 2nd wavelength which penetrated the 1st hologram component and leading to said photo detector, it has the 2nd hologram component which does not diffract the light of the 1st wavelength.
[0018] The 1st and 2nd hologram components are formed so that, as for optical pickup equipment according to claim 3, the product of zero-order diffraction efficiency and the primary -primary diffraction efficiency may become max to the light of the 1st and 2nd wavelength in optical pickup equipment according to claim 1 or 2, respectively.
[0019] In optical pickup equipment according to claim 1 to 3, the 1st hologram component and the 2nd hologram component are formed in the 1st substrate and the 2nd substrate independently for optical pickup equipment according to claim 4 possible [adjustment], respectively.
[0020] Optical pickup equipment according to claim 5 is set to optical pickup equipment according to claim 1 to 3. The 1st and 2nd hologram components The formation part of a hologram is lower than the substrate side of the circumference of it, and the hologram component which is formed in the 1st substrate and the 2nd substrate by which the laminating was carried out on the abbreviation same optical axis, respectively, and was formed in the field which contacts mutually [the 1st substrate and the 2nd substrate] is formed.
[0021] Optical pickup equipment according to claim 6 is set to optical pickup equipment according to claim 1 to 3. The 1st and 2nd hologram components It is formed in the 1st substrate and the 2nd substrate by which the laminating was carried out on the abbreviation same optical axis, respectively. The crevice is formed in the part which counters one [in the substrate with which one side of the 1st

hologram component and the 2nd hologram component is formed in the field which contacts mutually / the 1st substrate and the 2nd substrate /, and the hologram component of another side was formed / said] hologram component.
[0022] Optical pickup equipment according to claim 7 is formed in the 1st substrate and the 2nd substrate with which the 1st and 2nd hologram components have been arranged on an abbreviation same optical axis in optical pickup equipment according to claim 1 to 3, respectively, and the laminating of the 1st substrate and 2nd substrate is carried out through the spacer.
[0023] In optical pickup equipment according to claim 2, it is formed in the 1st substrate and the 2nd substrate with which the 1st and 2nd hologram components have been arranged on an abbreviation same optical axis, respectively, and, as for optical pickup equipment according to claim 8, said diffraction grating for beam division is formed in the field of the opposite side of the forming face of the 2nd hologram component in the 2nd substrate.
[0024] In optical pickup equipment according to claim 1 to 8, the 1st light source of optical pickup equipment according to claim 9 is the red laser of 650nm band, the 2nd light source is the infrared laser of 780nm band, the channel depth of the 1st hologram component is 1.7-1.8 micrometers, and the channel depth of the 2nd hologram component is set as 1.3-1.4 micrometers.
[0025]
[Embodiment of the Invention] The gestalt of operation of this invention is shown in a detail using drawing. In addition, the same sign shows the same thing as the component shown in the conventional example.
[0026] In addition, with the gestalt of the following operations, it has the two light sources (semiconductor laser) which carry out outgoing radiation of the light beam of 650nm band and 780nm band, and the optical pickup equipment which divides only the light of 780nm band into three beams, and irradiates an optical disk is explained. However, this invention is not restricted to this and the number of exposure wavelength and a light beam etc. can be changed suitably.
[0027] <Gestalt 1 of operation> drawing 1 is the mimetic diagram showing the configuration of the optical pickup equipment of the gestalt 1 of operation of this invention. This pickup is the same configuration as drawing 12 fundamentally, and gives the same sign to the same component as drawing 12 .
[0028] It has the 2nd hologram component 11, collimator lens 13, objective lens 6, and photo detector 14 to which the 1st semiconductor laser 1 which oscillates this optical pickup with 650nm band, and the 2nd semiconductor laser 2 oscillated with 780nm band diffract only the diffraction grating 3 for 3 beams which contiguity arrangement is carried out [diffraction grating] and produces three beams for tracking control, the 1st hologram component 12 which diffracts only the light of the 1st semiconductor laser, and the light of the 2nd semiconductor laser.
[0029] The diffraction grating 3 for 3 beams, the 1st hologram component 12, and the 2nd hologram component 11 are arranged as follows. That is, a diffraction grating 3 is formed in the transparence substrate 16 bottom, and the hologram component 11 is formed in the bottom. Moreover, the hologram component 12 is formed in another transparence substrate 17 bottom. And adjustment immobilization of the transparence substrate 16 is carried out in the laser outgoing radiation side of the laser package 15, and adjustment immobilization of the transparence substrate 17 is carried out on it. In addition, although considered as the configuration which forms one hologram component and diffraction grating in both sides of one substrate, and forms the hologram component of another side in one side of another substrate, if it does in this way, components mark are reducible here.
[0030] Drawing 2 (a) is the 1st semiconductor laser 1 of 650nm band, and is drawing showing the actuation in the case of playing an optical disk. After the light which carried out outgoing radiation from semiconductor laser 1 penetrates a diffraction grating 3 and the hologram components 11 and 12 and being made parallel light by the collimator lens 13, it is condensed on an optical disk 7 with an objective lens 6, and the light which has reflected and returned is diffracted with the hologram component 12, and is drawn on a photo detector 14.
[0031] Drawing 2 (b) is the 2nd semiconductor laser 2 of 780nm band, and is drawing showing the

actuation in the case of playing an optical disk. After the light which carried out outgoing radiation is separated into three beams from semiconductor laser 2 by the diffraction grating 3, penetrating the hologram components 11 and 12 and being made parallel light by the collimator lens 13, it is condensed on a disk 7 with an objective lens 6, and the light which has reflected and returned is diffracted with the hologram component 11, and is led to a photo detector 14.
[0032] In addition, the hologram components 11 and 12 are designed so that the condensing property of hope of return light on a photo detector 14 may be acquired to the light beam from semiconductor laser 2 and 1, respectively.
[0033] Next, the hologram components 11 and 12 of the gestalt of this operation are explained.
** The diffraction efficiency of the hologram component of the shape of a wavelength selection nature rectangle of a hologram component is shown in drawing 3 and drawing 4 . The diffraction efficiency of a rectangle-like hologram with equal groove width of face and land width is zero-order diffraction-efficiency (permeability) eta0=(cos**phi) 2 primary [**] diffraction efficiency, when it is channel depth t, wavelength lambda, and the refractive index n of a transparence substrate. eta1=(2-/pixsin**phi) 2 (however, ** phi=pi t (n-1)/lambda)
It is come out and expressed.
[0034] Drawing 3 shows the relation between the wavelength of 650nm, zero-order [780nm] and primary [**] diffraction efficiency, and a channel depth. Moreover, drawing 4 shows the product (both-way use effectiveness) of zero-order diffraction efficiency and primary [**] diffraction efficiency, and the relation of a channel depth. In addition, hologram glass is set to a quartz n= 1.457 (lambda= 650nm) and n= 1.454 (lambda= 780nm) here.
[0035] In the gestalt of this operation, one of hologram components need to diffract as many light as possible, and it is necessary to lead to a photo detector, and to the light beam of each wavelength, another hologram component almost needs to diffract light, and needs to twist (that is, the stray light is lessened as much as possible), and it is necessary to set up a channel depth like so that the use effectiveness of light can be earned.
[0036] Therefore, for example, the channel depth of the hologram component 12 which diffracts only the light of the 1st semiconductor laser 1 with a wavelength of 650nm It is referred to as about 1.7 micrometers to which the diffraction efficiency of 650nm is set to about 0 in drawing 4 , and diffraction efficiency becomes large by 780nm. What is necessary is just to set the channel depth of the hologram component 11 which diffracts only the light of the 2nd semiconductor laser 2 with a wavelength of 780nm to about 1.4 micrometers to which the diffraction efficiency of 780nm is set to about 0 in drawing 4 , and diffraction efficiency becomes large by 650nm.
[0037] The diffraction efficiency in the wavelength of another side [in / in the both-way use effectiveness of the light beam of the 2nd semiconductor laser 2 with a wavelength / according / the both-way use effectiveness of the light beam of the 1st semiconductor laser 1 with a wavelength / by the hologram component 12 / of 650nm / to about 9% and the hologram component 11 / of 780nm / about 8% and each hologram components 11 and 12] is about 0, and it stops producing loss of the quantity of light, and generating of the stray light at this time. If the channel depth of 1.7-1.8 micrometers and the hologram component 11 is set as 1.3-1.4 micrometers for the channel depth of the hologram component 12 even if it takes processing tolerance etc. into consideration, the property of practical use level will be acquired.
[0038] Moreover, the diffraction grating 3 for three beams is making it the channel depth of 1.4 micrometers, to light with a wavelength of 780nm, it is subbeam (primary [**] diffraction efficiency) 12%, and suitable 3 beam quantity of light ratio is obtained main beam (zero-order transmission) 72%. Moreover, to 650nm light, diffraction efficiency is hardly influenced by about 0 at this time.
[0039] ** The division pattern of the hologram components 11 and 12 and servo signal detecting method drawing 5 show the division pattern of the hologram component 12 which diffracts only the light of the 1st semiconductor laser 1, and the division pattern of a photo detector 14.
[0040] The hologram component 12 is equipped with four division fields, 12a, 12b, 12c, and 12d, quadrisected in the shape of a cross joint by making the substantial core of a return light beam into a

zero. Moreover, the photo detector 14 is equipped with six two 2 division light-receiving fields (14a, 14b) and fields [of (14c, 14d), and others / 14e and 14f] fields.
[0041] The return light diffracted by division field 12a of the hologram component 12 in a focus condition like drawing 5 (a) A beam P1 is formed on 14l. of parting lines prolonged in the x directions of 2 division light-receiving field (14a, 14b). A beam P2 is formed on 14m of parting lines to which the return light diffracted at 12d of division fields extends in the x directions of 2 division light-receiving field (14c, 14d), and the division fields 12c and 12b form beams P3 and P4 on 14f of light-receiving fields, and 14e, respectively.
[0042] If an optical disk 7 approaches relatively [side / objective lens 6] from a focus condition, beams P1 and P2 will become large like drawing 5 (b) at the light-receiving field 14a or 14c side, respectively. On the other hand, if it keeps away relatively conversely, it will become large like drawing 5 (c) at the light-receiving field 14b or 14d side, respectively. The focal error signal FES uses this property, and is FES=(Sa+Sc)-(Sb+Sd) by the knife-edge method.
It is detectable with ******.
[0043] Moreover, the tracking error signal TES is detectable with a phase contrast method by the disk only for playbacks in which the concavo-convex pit was formed by carrying out the comparison operation of the phase of Sa, the sum signal of Sb and Sf, and the sum signal of Sc, and Sd and Se. In addition, TES by the push pull method is also detectable with the operation of (Sa+Sb+Se)-(Sc+Sd+Sf). Furthermore, it is also possible to generate TES in a phase contrast method or the push pull method only using the light of one side 12b and 12c of a beam, i.e., division fields, or division fields [12a and 12d] one side.
[0044] In addition, an information regenerative signal is acquired from the sum of all output signals.
[0045] Next, the signal detection method is explained to be the division pattern of the hologram component 11 which diffracts only the light of the 2nd semiconductor laser using drawing 6 . In addition, the photo detector 14 is the same.
[0046] The hologram component 11 is equipped with two division fields of 11a and 11b which were carried out by 2 ****s of the parting lines of the direction of X. Moreover, since there is a diffraction grating 3 for three beams as drawing 1 explained to the hologram component 11 bottom, the outward trip beam which faces to a disk is separated into three from laser along about Y directions, and return light also has an include angle in the direction of Y, and comes to it on the contrary.
[0047] Like drawing 6 (a), about the return light of a main beam The light diffracted by division field 11a of the hologram component 11 in the focus condition A beam P1 is formed on 14l. of parting lines prolonged in the x directions of 2 division light-receiving field (14a, 14b), and the light diffracted by division field 11b forms a beam P2 on 14m of parting lines prolonged in the x directions of 2 division light-receiving field (14c, 14d). moreover, about the return light of the primary [+] subbeam The light diffracted in the division fields 11a and 11b of the hologram component 11 both forms beams P3 and P4 on light-receiving field 14e. About the return light of the primary [-] subbeam The light diffracted in the division fields 11a and 11b of the hologram component 11 constitutes so that beams P5 and P6 may be formed on [both] 14f of light-receiving fields.
[0048] If an optical disk 7 approaches relatively [side / objective lens 6] from a focus condition, beams P1 and P2 will become large like drawing 6 (b) at the light-receiving field 14b or 14c side, respectively. On the contrary, if it keeps away relatively, it will become large like drawing 5 (c) at the light-receiving field 14a or 14d side, respectively.
[0049] therefore, the case where the focal error signal FES uses the single knife-edge method using the above-mentioned property -- FES=Sa-Sb or -- It is detectable with the operation of FES=Sc-Sd.
[0050] Moreover, it is FES=(Sb+Sc)-(Sa+Sd) when the double knife-edge method is used.
It is detectable with ******.
[0051] In addition, the tracking error signal TES can detect TES by the 3 beam method by the operation of Se-Sf.
[0052] ** Explain important offset adjustment of FES in adjustment of the adjustment hologram component 12 of the hologram components 11 and 12. Drawing 7 (a) and (b) show only the hologram

component 12 and photo detectors [for FES detection / 14a, 14b, 14c, and 14d] part. The light diffracted by division field 12a of the hologram component 12 in the focus condition like above-mentioned drawing 5 (a) at the time of a design A beam P1 is formed so that it may condense on 14l. of parting lines prolonged in the x directions of 2 division light-receiving field (14a, 14b), and the beam P2 is formed so that it may condense on 14m of parting lines to which the light diffracted at 12d of division fields extends in the x directions of 2 division light-receiving field (14c, 14d).

[0053] However, in actual hologram / laser unification package, the relative position of a hologram, a laser chip, and a photo detector has shifted in a certain tolerance zone from the design value according to the laser chip, the anchoring error of a photo detector, a package, the processing error of a stem, etc. Therefore, the condensing beams P1 and P2 shift from on a parting line like drawing 7 (a), or it shifts from a condensing condition and the beam is large. Therefore, FES calculated by FES=(Sa+Sc)-(Sb+Sd) will generate offset also in the focus condition of an objective lens.

[0054] Then, by rotating the hologram component 12 and moving beams P1 and P2 on a parting line into a flat surface perpendicular to an optical axis, like drawing 7 (b), it adjusts so that offset of FES may be set to 0.

[0055] Moreover, adjustment with the same said of the hologram component 11 is performed. Drawing 8 (a) and (b) show only the hologram component 11 and photo detectors [for FES detection / 14a, 14b, 14c, and 14d] part. Although this is an example at the time of using the single knife-edge method the output difference of 14a and 14b detects FES, offset is made to be set to 0 by rotation adjustment like a hologram 12.

[0056] In the gestalt of this operation, contiguity arrangement of the two laser chips, 650nm and 780nm, is carried out. It shifts in a tolerance zone with the location of each chip, when it fixes to the stem which does not illustrate this, it is attached or there is dispersion in an emitting [laser] light point location, an outgoing radiation include angle, etc., but since offset adjustment of FES is performed with a respectively different hologram component (11 12), optimal adjustment can be independently performed to each semiconductor laser (1 2).

[0057] ** In the configuration above-mentioned optical system of a hologram component, as shown in drawing 9 (a), it is the block diagram which carries in piles two transparence substrates in which the hologram components 11 and 12 and a diffraction grating 3 were formed, and performs a location and rotation adjustment. a glass substrate -- etching -- etc. -- a hologram -- forming -- a case -- a hologram -- a component -- 11 -- a land -- a part -- a top face -- a hologram -- forming -- having -- **** -- a part -- 11 -- ' -- a diffraction grating -- three -- a land -- a part -- a top face -- forming -- having -- **** -- a part -- three -- ' -- the same -- a field -- becoming -- **** . The part in which, as for the top face of the laser package 15, i.e., the outgoing radiation side of a laser beam, in which the transparence substrate 16 is attached, a diffraction grating 3 is located usually like drawing 9 (a) does not have a problem, in order to contact, but it may get damaged when the fine structure piles up the transparence substrate 17 about the hologram component 11 formed in the top face of the transparence substrate 16, for example. The example which performed the cure to this is shown below.

[0058] After it carves and investigates a hologram formation part by etching etc. first, drawing 9 (b) forms a hologram, or he removes a land from the same field further, and is trying to investigate it in the case of a glass substrate, when forming the hologram component 11 in the transparence substrate 16. Moreover, what is necessary is also in the case of molding processing using plastics or a glass ingredient, just to form a mold configuration so that a circumference part may become high from a hologram component part.

[0059] Moreover, drawing 9 (c) is the example which investigated the transparence substrate 17 bottom. Since this does not need to change the complicated production approach of the hologram component 11, it can perform high processing of precision easily.

[0060] Drawing 9 (d) fixes both on both sides of a spacer between two transparence substrates 16 and 17. Even when the transparence substrate which formed the hologram component of two sheets by this is fixed in piles, the hologram formed in the part pinched by both does not get damaged at the time of adjustment.

[0061] As explained above, with the optical pickup equipment of the gestalt of this operation As opposed to the 1st semiconductor laser 1 oscillated with 650nm band by which contiguity arrangement was carried out, and the 2nd semiconductor laser 2 oscillated with 780nm band Although arranged in order of the diffraction grating 3 for 3 beams which produces three beams for tracking control, the hologram component 11 which diffracts only the light of the 2nd semiconductor laser, and hologram component which diffracts only light of 1st semiconductor laser 12** It is not necessary to constitute especially from this sequence, and the hologram components 11 and 12 should just be formed in another substrate. The diffraction grating 3 for 3 beams and the hologram component 11 which produce three beams for tracking control which merely diffract only the light of the 2nd semiconductor laser 2 are [no need for adjustment of the direction currently positioned and formed in both sides of one transparence substrate] and are advantageous.

[0062] Moreover, when detecting a signal with one beam, without using the 3 beam method for TES, the diffraction grating for 3 beams is unnecessary.

[0063] <Gestalt 2 of operation> drawing 10 is the mimetic diagram showing the configuration of the gestalt 2 of operation. Although the configuration of an optical pickup is the same as that of the gestalt 1 (drawing 1) of operation fundamentally, the approaches a semiconductor laser chip should cling differ. This part is explained using drawing 10 . The same sign is shown in the same component.

[0064] In the gestalt 1 of operation, contiguity arrangement was carried out and the laser chip of two different wavelength was attached. However, for a certain reason, the width of face of a direction perpendicular to an optical axis will also leave about 100-300 micrometers also of distance between each point emitting light more than it, and an inclination will produce a laser chip in an optical axis in the laser beam of two different wavelength in the optical system shown in drawing 1 . The aberration generated with an optical-axis inclination is designed so that it may become small with a collimator lens or an objective lens to some extent, but if the distance between the points emitting light becomes large, it will become a problem as a property of pickup.

[0065] Then, in the gestalt of this operation, in order to make in agreement the optical axis of the light beam from a different laser chip, prism is used. As shown in drawing 10 , only distance d1 is detached to a stem 26, the 1st semiconductor laser 1 and 2nd semiconductor laser 2 are attached in it, and the beam splitter 21 which is from three members, 21a, 21b, and 21c, on the outgoing radiation side side is formed. This has two reflectors, 19 and 20, reflects the light of the 2nd semiconductor laser in respect of [19] separation, and is having structure of making the light of the 1st semiconductor laser penetrating. Although the property of this separation side is giving wavelength selection nature, when both polarization directions differ, a polarization beam splitter is sufficient as it. 45 degrees of each reflector incline to an optical axis, and it can make two light beams which came out of the 1st and 2nd semiconductor laser in agreement with the same optical axis by setting up the board thickness of member 21b so that it may have the direction distance of an optical axis between the reflectors equivalent to d1.

[0066] Moreover, about the 1st semiconductor laser 1 and 2nd semiconductor laser 2, since it will become the same optical axis after compounding by the beam splitter 21, even if it arranges in which location if it is on the 1st optical axis 22 and the 2nd optical axis 23 on a stem, respectively, it is also possible to shift one laser from the focal location of a collimator lens, and to use it as emission light or a convergence light.

[0067] It can respond to the optical disk of specification with which the plurality which carries out record playback by this using the light beam of different wavelength differs, and assembly adjustment is easy and the compatible optical pickup which was moreover suitable for small integration can be realized.

[0068] <Gestalt 3 of operation> drawing 11 is the mimetic diagram showing the principal part of the optical pickup equipment of the gestalt 3 of operation. Although the configuration of an optical pickup is the same as that of the gestalt 1 (drawing 1) of operation fundamentally, the configurations of the synthetic prism of the approach a semiconductor laser chip should cling, and two semi-conductor laser beams differ. In addition, in drawing 11 , the same sign is given to the same component as drawing 1 .

[0069] In the gestalten 1 and 2 of operation, since two hologram components 11 and 12 were mostly arranged on the same optical axis, for the improvement in efficiency for light utilization, or stray light removal, they needed to set the diffraction grating 3 for 3 beams, and the hologram component 11 as a channel depth which diffracts only the light of the 2nd semiconductor laser 2, and needed to set the hologram component 12 as a channel depth which diffracts only the light of the 1st semiconductor laser 1. In this case, there is a trouble that a channel depth becomes deeper than usual, or processing tolerance also becomes severe.
[0070] About the optical pickup equipment which can detect the light beam from two different laser by the common photo detector even if it does not use the hologram of what solves the above-mentioned trouble, i.e., wavelength selection nature, and can make an optical axis in agreement, as shown in drawing 11 , the gestalt of this operation detaches and attaches the 1st semiconductor laser 1 and 2nd semiconductor laser 2 in a stem 26, and considers them as the configuration which arranges a photo detector 14 in the meantime.
[0071] In the gestalt of this operation, the transparence substrates 16 and 17 are separately arranged after each laser chip, and for this reason, each hologram components 11 and 12 can be constituted so that only one light beam may pass. And the zero-order transmitted light which penetrated each hologram component is compounded on the same optical axis by the beam splitter 24 which has the prism 25 and separation side 24a which have reflective mirror side 25a. The light beam which reflected and has returned from the disk is led to the common photo detector 14 with the hologram components 11 and 12 by which a location and rotation adjustment were carried out independently according to the individual, respectively.
[0072] It can respond to the optical disk of specification with which the plurality which carries out record playback using the light beam of different wavelength, without production using the hologram component of difficult wavelength selection nature by this configuration differs, and assembly adjustment is easy and becomes possible [realizing the compatible optical pickup which was moreover suitable for small integration].

[Translation done.]

DESCRIPTION OF DRAWINGS

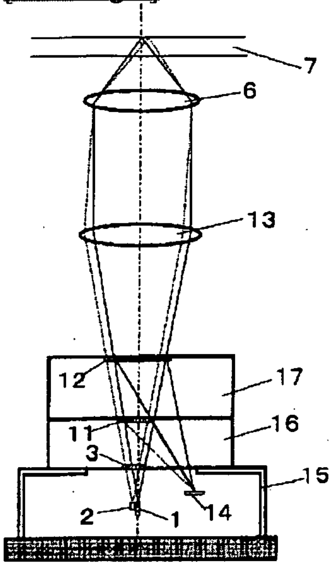
[Brief Description of the Drawings]
[Drawing 1] It is the outline block diagram showing the optical system of the optical pickup equipment of the gestalt 1 of operation of this invention.
[Drawing 2] In the optical pickup equipment of drawing 1 , it is the playback optical system at the time of using the 1st or 2nd semiconductor laser.
[Drawing 3] It is as a result of [of having expressed the channel depth of a hologram, and the relation of diffraction efficiency (zero-order and 1st / **/ order)] count.
[Drawing 4] It is as a result of [of having expressed the channel depth of a hologram, and the relation of diffraction efficiency (zero-order and primary / **/ product)] count.
[Drawing 5] It is drawing explaining the division pattern of the 1st hologram component and photo detector.
[Drawing 6] It is drawing explaining the division pattern of the 2nd hologram component and photo detector.
[Drawing 7] It is drawing explaining adjustment of the 1st hologram component.
[Drawing 8] It is drawing explaining adjustment of the 2nd hologram component.
[Drawing 9] It is drawing explaining the configuration of two hologram component substrates.
[Drawing 10] It is the outline block diagram showing the optical system of the optical pickup equipment of the gestalt 2 of operation of this invention.
[Drawing 11] It is the outline block diagram showing the optical system of the optical pickup equipment of the gestalt 3 of operation of this invention.
[Drawing 12] It is the outline block diagram showing the optical system of conventional optical pickup equipment.
[Description of Notations]
1 1st Semiconductor Laser
2 2nd Semiconductor Laser
3 Diffraction Grating for 3 Beams
5 Grid Lens
6 Objective Lens
7 Disk
8 Hologram Component
9 Photo Detector
11 2nd Hologram Component
12 1st Hologram Component
13 Collimator Lens
14 Photo Detector
15 Laser Package
16 Transparence Substrate
17 Transparence Substrate

18 Spacer

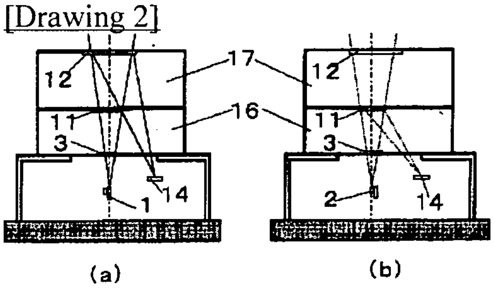
[Translation done.]

DRAWINGS

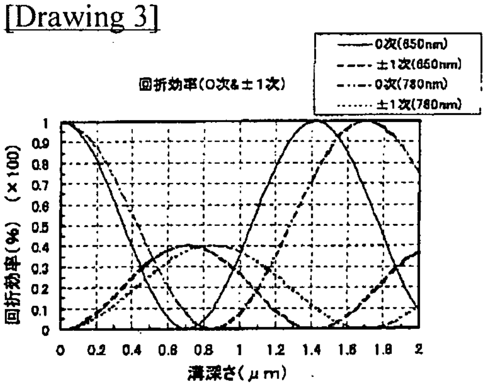
[Drawing 1]



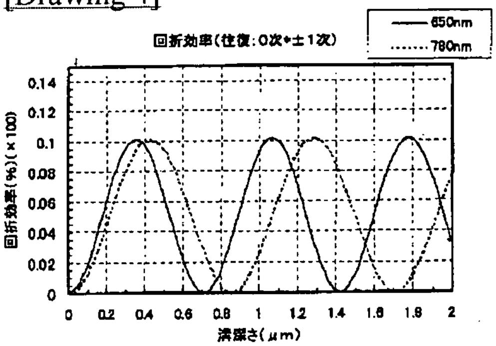
[Drawing 2]



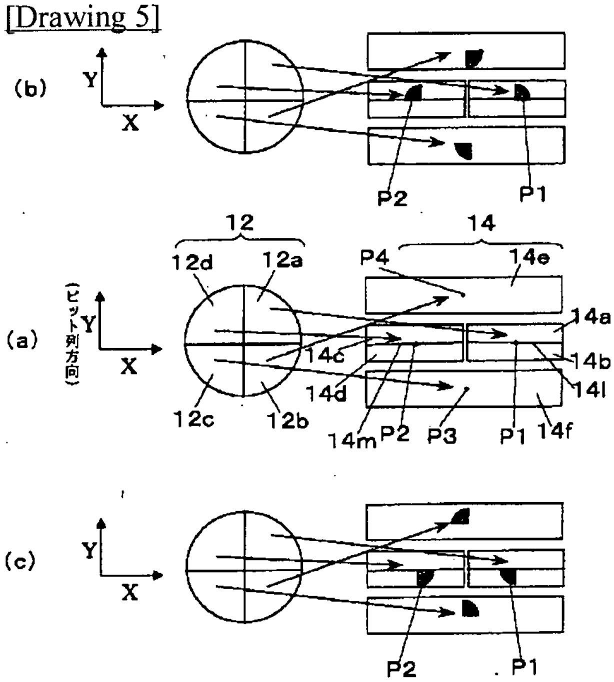
[Drawing 3]



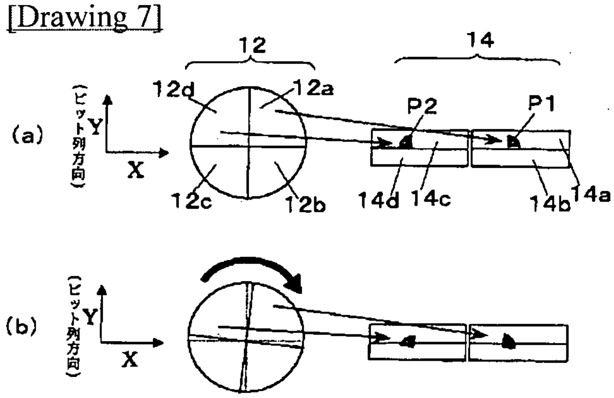
[Drawing 4]



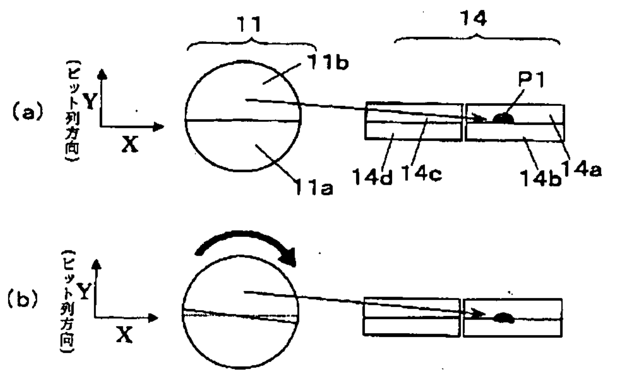
[Drawing 5]



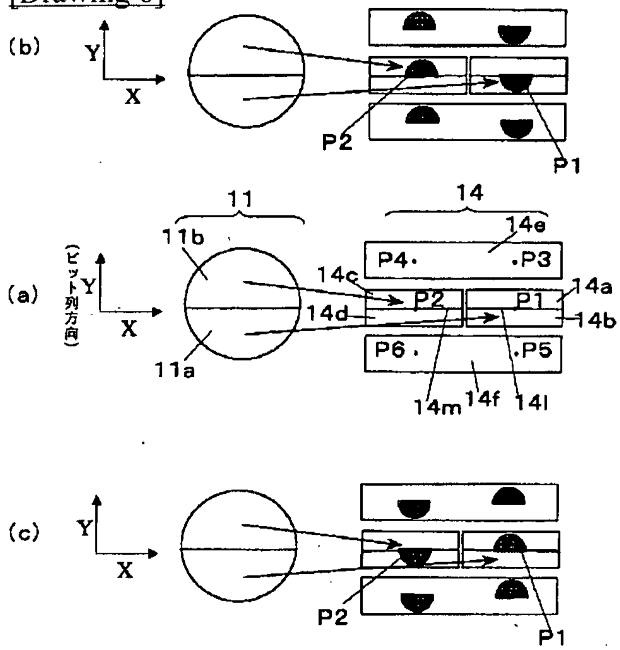
[Drawing 7]



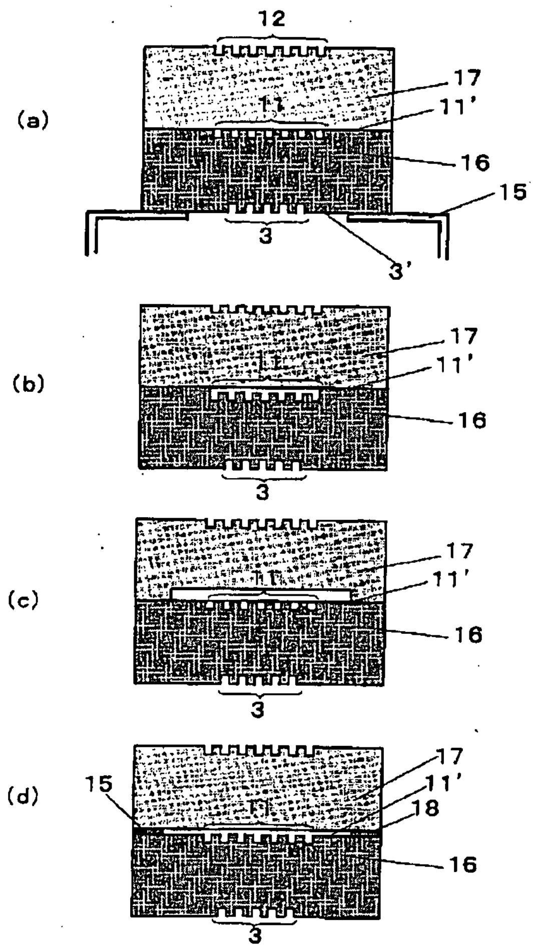
[Drawing 8]



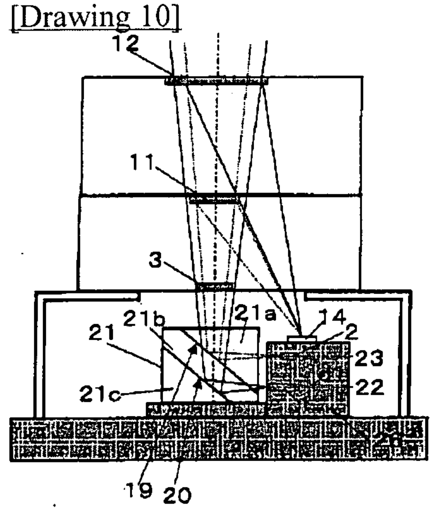
[Drawing 6]



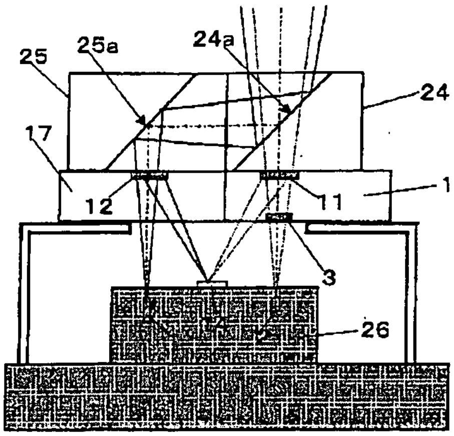
[Drawing 9]



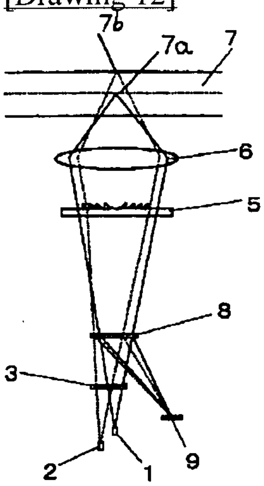
[Drawing 10]



[Drawing 11]



[Drawing 12]



[Translation done.]